Age: High School

Setting: Indoors/outdoors

Objective: Students will learn how wetlands function and understand the important role they play in the environment, ecosystem and economy through seasonal observations, specimen and field data collection.

Materials brought by students/teacher:

- Camera—to record pictures: pictures will be taken from various locations, and repeated at each of the trips
- Waders if students have their own
- Field journals: required for recording notes
- Pen/pencils
- Lunch/water
- Appropriate clothing: jacket, hats, gloves, OLD Shoes—preferably rubber boots in spring and fall
  - Unless there are extreme weather conditions, all field trips will go as scheduled

Materials provided by Prairie Waters:

- Waders
- D-nets
- Specimen containers
- 70% Alcohol
Lesson 1: Fall

Objective: At the end of this lesson, students should be able to:

1. Define what a wetland is and some of its characteristics.
2. List and define the types of wetlands
3. List the functions of wetlands
4. Make and record observations at a wetland
5. Identify at least 5 wetland plants
6. Identify at least 6 aquatic invertebrates
7. Know the characteristics of hydric soil

Math Connection

1. Be able to explain the difference between qualitative and quantitative sampling
2. Explain what quadrats and transects are and why they are used
3. Calculate population and density of macros
4. Shannon-Weiner Index

Location: Stoney Slough Waterfowl Production Area and Prairie Waters Education and Learning Center, Kathryn, ND.

Background:

We know, from informal experience, that much of what defines a wetland – appearance of vegetation, places where we expect to see specific birds and mammals, environments marked by the presence of water....but wetlands are more subtle, varied and full of surprises than these superficial observations suggest. Wetlands have been called by many names – swamps, potholes, sloughs, ponds, lakes, fens, etc., and to confuse matters further, a wetland may not even appear obviously wet! Some wetlands hold water only on occasion – but the periodic presence of water defines it as a wetland.

North Dakota’s wetlands are part of the Prairie Pothole Region of North America, which covers 300,000 square miles and is full of thousands and thousands of “potholes” or sloughs. These provide the most important breeding habitat for waterfowl, water birds, shore birds, and grassland birds on the continent. Although it represents only 4% of North America, it some years, it produces over 50% of the continent’s duck production and provides critical breeding and migration habitat for more than 200 other bird species.
It is an environment capable of supporting vast numbers of waterfowl and has been called the duck factory of North America. This unique wetland niche is a legacy of the most recent glacial ages. When the vast ice sheet retreated northward, gouging the earth with boulders and abandoning hunks of underground ice to melt, it left behind a topography full of small, water-filled depressions. Over time, plants such as arrowhead and sago pondweed colonized the seasonally flooded wetlands, while cattails and grasses grew into a sheltering habitat for many wildlife species. A delicate balance of timely precipitation, warm summer temperatures, and poorly drained soils has maintained the prairie potholes since the last Ice Age.

What is a wetland? Just that—“wet land”. It is a basin that holds water for as little as a few days, or as long as several months or all year long. There are four main types of wetlands: temporary, seasonal, semi-permanent, and permanent which are differentiated by the length of time they hold water. The water comes from rain, snow-melt, and run-off.

Wetlands have three main characteristics: water, hydric (water saturated, anaerobic) soil, hydrophytic (water tolerant) plants. The process of deciding where a wetland starts and ends is known as delineation. Soil, plants, and water characteristics are the defining wetland indicators. Delineation focuses on hydric (saturated) soils, hydrophytic (water tolerant) plants, and a specific hydrologic (water) regime.

- Hydric soils are saturated long enough during the growing season to create an anaerobic (low oxygen) state in the soil. This lack of available oxygen limits the number of plant species that can survive there. Anaerobic conditions create some obvious characteristics that can be explored with your senses: a sulfurous (rotten egg) smell, soil that ranges in color from green to brown to dark gray to black, and soil that oozes between your fingers.

- Hydrophytic plants have adapted to thrive in wetlands despite the stresses of an anaerobic and flooded environment. Most upland plants take in oxygen through root systems and distribute it through their stems and leaves. To succeed in their water-logged environment, wetland plants must employ other strategies such as long, oxygen-transporting tubes (emergent reeds), or the ability to float on shallow water (duckweed). Plants are often the most obvious indicators of a wetland. Plant diversity makes wetlands valuable to both wildlife and humans. A wide variety of plants offers good habitat for many animals, because there are simply more options for food and shelter (places to hide). Plants are indicators of the health of a wetland and the quality of water. Plants can be emergent (rooted in the wetland soil and growing out of the water), subemergent (found below the surface of the water), or floating freely at the surface of the water.

- A hydrologic (water) regime refers to the changing presence of water. The water level is typically at, just below, or just above the ground’s surface, creating the saturated conditions that lead to the development of hydric soils and the presence of hydrophytic plants. Although water is the defining circumstance of a wetland, it isn’t always easy to
find. Some wetlands are only damp, and some are saturated just below the surface. Others are flooded on occasion. It is not always easy to conclude that an area is actually a wetland, but if you look closely, wetlands will usually show signs of water: spongy or mushy ground, mud or dried cracks in low spots, and water staining on vegetation.

- **Functions of wetlands**
  - **Flood control** – wetlands act as protective natural sponges by capturing, storing, and slowly releasing water over a long period of time, thereby reducing the impact of floods. This run-off storage curbs river volume, reducing both the velocity and stage of floodwaters. Water stored in wetland soils is released steadily over weeks and months rather than in a sudden and uncontrolled pulse.
  - **Ground water recharge** – contribute to ground water and are important in recharging aquifers.
  - **Sediment traps** – wetlands improve water quality by acting as sediment sinks, or basins. They are especially effective at trapping sediments in slow-moving water.
  - **Improved water quality** – Wetland vegetation slows water velocity, and particles settle out as current speeds decrease. Pesticides, heavy metals and other residues are buried, along with sediments, in layers of wetland soil.
  - **Decreased turbidity** (cloudiness from sediment) allows sunlight to penetrate more effectively, encouraging the growth of tiny organisms that make up the base of the food web and add oxygen to the water through photosynthesis.
  - **Food production** – wild rice and cranberries are examples of wetland crops that can be harvested and consumed directly. However, the greatest food contribution accrues from wetland soils that have been drained and turned into agricultural lands or that are under cultivation during dry periods. Wetland soils are nutrient-rich, full of organic material, and generally less prone to erosion than other soils. They tend to be highly productive, especially in the first decade of planting. Drained wetland soils in the United States, taken as a whole, produce more than 25 percent of all major crops, a monetary value of roughly $9 billion. Throughout the world, wetland soils consistently outperform other cultivated land. BUT...of course, once wetlands are permanently drained, the conditions that created productive soils are lost.
  - **Wildlife habitat** – wetlands are both home and supermarket to many species of wildlife that utilize wetlands for food, shelter, spawning, nesting, or predatory opportunities. Eighty percent of all breeding bird populations in the United States, along with more than half of the protected migratory bird species, rely on wetlands at some point in their life cycle.
  - **Recreation** – the recreation, aesthetics, and educational benefits of wetlands are numerous, yet tough to quantify. Hunting, fishing, boating, bird watching, canoeing, and more, all contribute billions of dollars to the economy on an annual basis.

**In Summary** - once a wetland is drained, the conditions that create productive soils are lost, along with benefits like flood control, water purification, ground water recharge, recreation, and wildlife habitat. The loss of wetland habitat can be quite noticeable...there is a decline in species and population levels,
more flooding events, and contamination of ground water. Unfortunately, we notice these signs too late, as the wetland habitats have already been drained. It is important for people to ‘keep an eye out for wetlands’ in order to protect the benefits that are received from them.

- The wetland we will study is Stoney Slough National Wildlife Production Area. It is 880 acres that are part of the national wildlife refuge system, consisting of both permanent and temporary wetlands, located approximately 13 miles south and 4 miles west of Valley City, ND.

**Prior to your visit**

- Please give the “Wetlands Assessment” to the students prior to introducing this lesson. This is for Prairie Waters to determine the effectiveness of this program. We will have the students take the same assessment after completing the program in the spring.

- Review background information – use the information provided in the lesson plan, or other information found on-line or in field guides to introduce yourself and the classroom to wetland habitat and wildlife.

- Lesson Plan—word document containing background information, pre-trip preparation, and a tentative field day schedule.

- North Dakota Wetlands Power Point

- Map of Stoney Slough Wildlife Production Area

- Aquatic Organisms Power Point

- Vocabulary

- Wetland field journaling word document and power point

- Wetland Word Scramble

- Prior to taking students outdoors, visit with them about limiting disturbance to the wetland habitat, which is a home for many different kinds of animals and plants. Make sure they understand that they should not destroy the habitat or injure/kill any insects or other animals in the area.

- Visit with the students about appropriate attire for the wetland. This includes old clothes, old shoes, waders or rubber boots if they have them, and rain gear if needed.

- Divide students into groups of 3 or 4